This dissertation is the development of a centrifugal compressor design and analysis code that can be used to inexpensively design and analyze the performance of a centrifugal compressor. It can also be used to match the components of centrifugal compressor, to integrate and optimize system performance. The design system is being developed also with the intent to reduce the time taken to experimentally match a centrifugal compressor with operational environment, a task that is key to process industry application. The design and analysis code will use both one & two-dimensional thermo-fluid equations to analyze the compressor and its components. For each compressor component, the tool calculates the velocities, pressures, temperatures, pressure losses, energy transfer and transformation, and efficiencies for a specified set of compressor geometry, atmospheric conditions, rotational speed, and fluid mass flow rate. The design-tool will be based and include established loss models found in literature and extensive industrial experimental data. The other main feature of the design-tool will be its readily and easily integration and interaction with other CFD, CAM and Stress Analysis commercial packages.